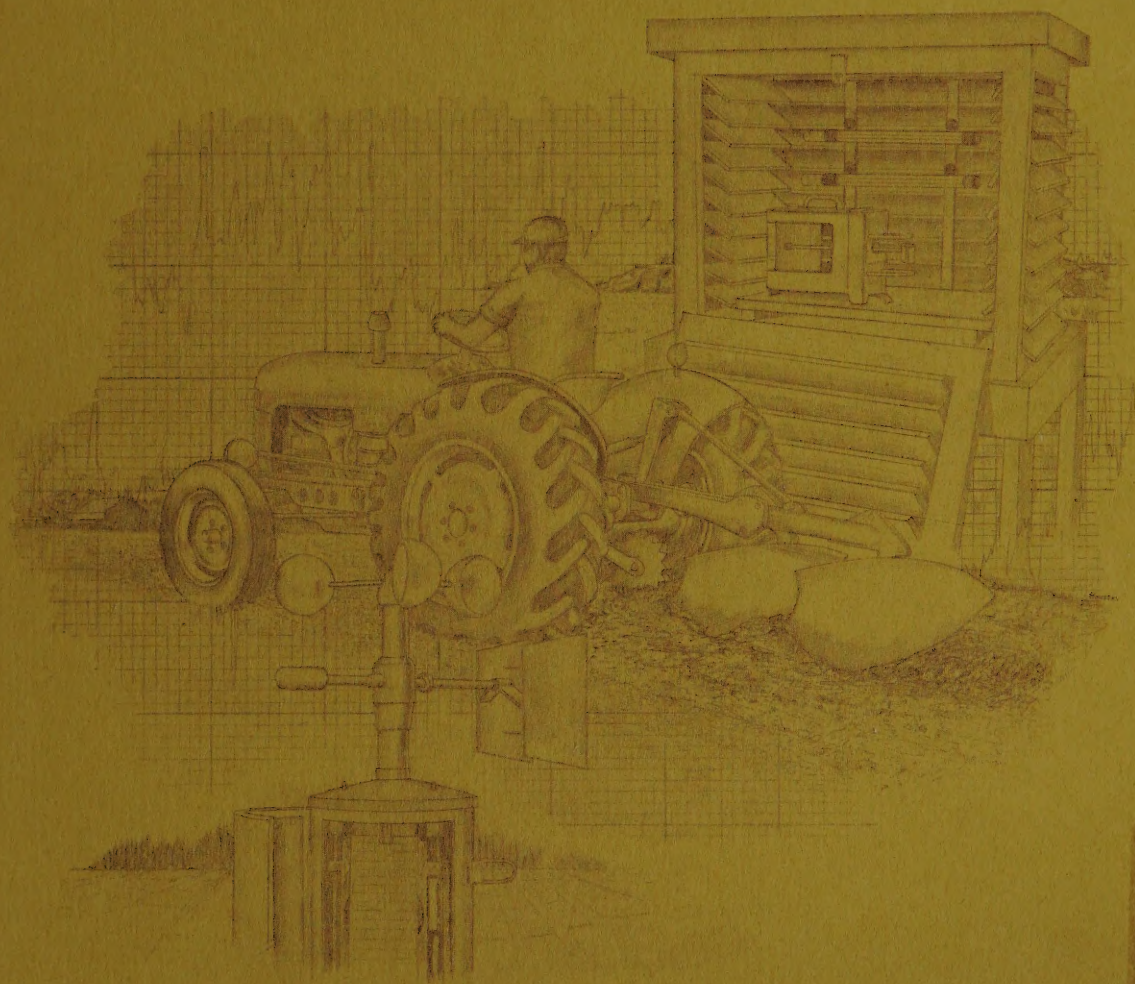


CLIMATE CAPABILITY CLASSIFICATION FOR AGRICULTURE



Climatology Report No. 1
November, 1972

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CLIMATE CAPABILITY CLASSIFICATION

FOR AGRICULTURE

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INTRODUCTION

ACKNOWLEDGEMENTS

The objectives, scope and organization of the Canada Land Inventory (CLI)

The Classification outlined in this publication is the result of the accumulated experience and work done by the B.C. Department of Agriculture, the B.C. Land Inventory (CLI), the University of British Columbia, and the Canada Department of Agriculture. Collectively this group is known as the B.C. Agro-Climatology Committee and as such represents the authorship of the paper.

Information derived from air photos. The end product of this part of the programme is a series of maps at the same scale, showing single use capabilities.

Underlying these single use capabilities for agriculture, forestry, recreation and wildlife is the limitation or enhancement provided by climate. Within the limits of our knowledge, climate influences to a greater or lesser degree all capabilities. To date only agriculture has been definitive enough in its needs to build a climate classification.

In the CLI system of classification, climate provides the basic limitations for agriculture to which all other limitations are tied. On a national basis climate participates at a variety of levels of significance depending on the variability of the climate in each province. In British Columbia the wide range of climates in Canada, special considerations must be given with each new inventory region and within each sub-region. Further, the national classification is designed for a broad base, hence is not broad

INTRODUCTION

The objectives, scope and organization of the Canada Land Inventory (CLI) are presented in Report #1.* Under these terms of reference an attempt is being made to classify land and its physical capability to support agriculture, forestry, recreation and/or wildlife. The inventory techniques are designed for a reconnaissance level survey relying on the collation, and extrapolation of existing information along with newly collected data and interpreted information derived from air photos. The end product of this phase of the programme is a series of maps at the same scale, showing single use capabilities.

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In the CLI system of classification, climate provides the basic limitations for agriculture to which all other limitations are tied. On a national basis climate participates at a variety of levels of significance depending on the variability of the climate in each province. As British Columbia has the widest range of climates in Canada, special considerations must be given with each new inventory region and within each sub-region. Further, the national classification is designed for a wheat base, hence is not broad

* The Canada Land Inventory, "Objectives, Scope and Organization", Report No. 1, Department of Forestry, Publication #1088, Queens Printer, Ottawa, 1965

enough in scope to cover the better and poorer climates of British Columbia.* The climates of the Okanagan-Boundary, Fraser Valley, Vancouver Island and mountainous areas of the province offer a variety of climates which cannot be satisfactorily classified under the national system.

CONSIDERATIONS AND ASSUMPTIONS

The climate of British Columbia reflects the topography of the region, its proximity to the Pacific Ocean and to the interior of the continent. Using physical parameters, particularly topographical shape, the land surface can be divided into units of similar climates. As might be expected, the vegetation situated on this "topography" very much reflects the climate on a regional basis while the climate reflects the vegetation on a local scale. Within this context then, both the biological and the physical components must be considered in portraying the climates of the land units.

The effects on climate of existing management practices should be kept in mind. Industrial development, man-made water bodies and harvesting by-products change the face of the land and change the local climates.

Certain assumptions must be made in applying and interpreting this classification. These are:

1. The separation of the land surface into units is on the basis of physical and biological similarities.
2. Each unit is defined on the basis of all available information on that unit. Past and present climatological and weather data, botanical

*See: The Canada Land Inventory, "Soil Capability Classification for Agriculture", Report No. 2, Queen's Printer, Ottawa, 1965.

material and all physical parameters relating to the topography, and any research material or experience presently available are all included.

3. In the event of insufficient information available, generalizations will be made on the basis of experience with similar factors and situations in adjacent areas.
4. Generally, existing agricultural management practices are presently being utilized in a specific region. The opportunities offered by alternative management practices will not be considered but may be indicated in a report.
5. The degree of limitation determines the class designation. The subclass is the factor which causes the limitation. Hence, there may be many different land units with the same class but the limitation(s) may be quite different.
6. Capability ratings are subject to change as new information becomes available.
7. The climate class is determined by the range of crops which can be grown. The wider the range of crops, the higher the class.
8. A maximum of 10 inches of available water is provided for each 4 feet of soil profile.
9. The soil profile is at field capacity at the start of the growing season. It is acknowledged that in some areas and in some years the soil profile will not satisfy this assumption due to early freezing of the soil and insufficient recharge between the summer moisture deficit period and freezeup.
10. The soil classifier will review his legend, and adjust for those soils which, due to bedrock, material stratification, lime layers, preclude the assumption made in (8) above.

CLIMATE CAPABILITY CLASSES

Climatic Class 1d

Identifying Area

Oliver, Osoyoos, Cawston, Keremeos

Characteristics

The frost free period is greater than 150 days.

Growing degree days accumulated above 42°F are greater than 3800.

A large thermal accumulation occurs above 55°F.

Full capacity can only be achieved if supplemental water is supplied.

Winter Climate

The probability of having -15°F or lower for more than five days is nil.

Snow cover is discontinuous.

Range of Crops

- (a) Key crops - apricots, peaches, zucca melon, cantelope, Winesap apples and a wide variety of grapes.
- (b) General - apples (early), asparagus, white and green beans, sugar beets, cherries, sweet corn, cucumbers, melons, peppers, early potatoes, pears, plums, raspberries, prunes, tobacco, tomatoes and cereal grains (including winter wheat).
- (c) Cool Season Vegetables* - cabbage (early season), lettuce, peas, spinach and strawberries.

Climatic Class 1c

Identifying Area

Summerland, Penticton, Naramata, Kaleden, Okanagan Falls, Peachland, Westbank and Kelowna in the areas near Okanagan Lake.

Characteristics

The frost free period is greater than 150 days

The range of growing degree days accumulated above 42°F is 3500 to 3800.

Some thermal accumulation occurs above 55°F.

Full capacity can only be achieved if supplemental water is supplied.

Winter Climate

There is a 10% chance of having winter minimums less than -15°F.

Snow cover is continuous.

Range Crops

- (a) Key crops - peaches, apricots and grapes
- (b) General - apples, asparagus, white and green beans, sugar beets, cherries, sweet corn, cucumbers, melons, peppers, potatoes, pears, prunes, raspberries, tobacco, tomatoes.
- (c) Cereal grains

* This period occurs early in the season between the beginning of the frost free period and the start of the thermal period. The thermal period occurs when mean daily temperatures are greater than 55°F.

Climatic Class 1b₁*

Identifying Area

Kelowna and Westbank in higher areas away from Okanagan Lake, Vernon, Oyama, Salmon Arm and Lillooet.

Characteristics

The frost free period is greater than 150 days.

The range of growing degree days greater than 42°F is 3000 to 3500.

Full capacity can only be achieved if supplemental water is supplied.

Winter Climate

There is a high probability of winter minimums less than -15°F for long periods.

Snow cover is continuous, except at Lillooet where alternate freezing and thawing is a limitation.

A combination of wind and extreme minimum temperatures can be limiting.

Range of Crops

(a) Key crops - hardy apples

(b) General - asparagus, white and green beans, sugar beets, sweet corn, cucumbers, melons, peppers, potatoes, tomatoes, no soft fruits.

(c) Cool Season Vegetables - cabbage, lettuce, peas, spinach, strawberries.

(d) Cereal grains

Climatic Class 1b₂

Identifying Area

Kamloops to Barriere on the North Thompson River

Characteristics

The frost free period is greater than 150 days.

The range of growing degree days greater than 42°F is 3000 - 3800.

A large thermal accumulation occurs above 55°F.

Full capacity can only be achieved when supplemental water is supplied.

Winter Climate

There is a high probability of freezing of even hardy varieties of apples.

Winter extreme minimums are relatively severe.

Snow cover is continuous.

Range of Crops

(a) Key crops - (heat loving crops) - asparagus, peppers, melons, tomatoes, watermelons and cucumbers.

(b) Early season fast maturing, cool loving vegetables - cabbage, lettuce, peas, spinach, strawberries.

(c) Cereal grains

* There are three examples of Climatic Class 1b because the range of crops in this category is relatively the same even though there are regional differences in individual climate parameters.

Climatic Class 1b₃

Identifying Area

Lower Fraser Valley, Saanich Peninsula and East Coast of Vancouver Island.

Characteristics

The frost free period is greater than 150 days.

The range of growing degree days greater than 42°F is 3000 to 3500.

Full capability can only be achieved if supplemental water is supplied.

There are cool winter temperatures suitable for wintering cabbage and lettuce.

A 30-inch maximum annual precipitation limit occurs for tree fruits.

Winter Climate

The probability of extreme winter temperatures exceeding -10°F is nil.
Snow cover is discontinuous.

Range of Crops

- (a) Key crops - Wide range of cool season crops such as: canning peas, cole crops, potatoes, raspberries, small fruits, sugar beet seed, lettuce and bulbs.
- (b) A limited range of heat loving crops such as: beans, corn, cucurbits, narrow range of grapes, tomatoes, hardy tree fruits, onions and pumpkin.
- (c) Cereal grains

Climatic Class 1a₁*

Identifying Area

Barriere north, Slocan, Columbia Gardens, Castlegar, Gang Ranch, and Grand Forks.

Characteristics

The frost free period is 120 to 150 days.

The range of growing degree days above 42° is 2500 to 3000.

Full capability can only be achieved when supplemental water is supplied.

Winter Climate

These are low minimum temperatures, occasionally below -35°F.
Snow cover is continuous.

Range of Crops

- (a) Key crops - corn, and hardy apples in select microclimates.
- (b) General - small fruits, asparagus, beans, beets, broccoli, brussel sprouts, cabbage, carrots, cauliflower, celery, Kohlrabi leeks, lettuce, parsnips, peas, potatoes, radishes, raspberries, rhubarb, spinach, Swiss chard, strawberries and turnips.
- (c) Cereal grains

* There are two examples of Climatic Class 1a for the same reason as foot-noted on page five.

Climatic Class 1a₂

Identifying Area

Creston and front benches adjacent to large lakes.

Characteristics

The frost free period is 120 to 150 days.

The range of growing degree days above 42°F is 2500 to 3000.

Full capability can only be achieved when supplemental water is supplied.

Winter Climate

Winter minimums do not exceed -30°F.

Snow cover is continuous.

Range of Crops

(a) Key crops - corn and McIntosh apples.

(b) General - small fruits, asparagus, beans, beets, broccoli, brussel sprouts, cabbage, carrots, cauliflower, celery, Kohlrabi, leeks, lettuce, parsnips, peas, potatoes, radishes, raspberries, rhubarb, spinach, Swiss chard, strawberries and turnips.

(c) Cereal grains

Climatic Class 1

Characteristics

The frost free period is 90-120 days.

The range of growing degree days greater than 42°F is 2150 to 2600.

Annual precipitation is more than 15 inches and the May-September precipitation is greater than 9 inches.

There is no significant heat deficiency and no serious moisture deficiency.

There is a climatic moisture deficit of 0 to 1.5 inches during the growing season in dryland areas.

Range of Crops

(a) Key crops - corn

(b) General -(wide range of vegetables and fruits), asparagus, beans, beets, broccoli, brussel sprouts, cabbage, carrots, cauliflower, celery, Kohlrabi, leeks, lettuce, parsnips, peas, potatoes, radishes, rhubarb, turnips, spinach, Swiss chard, strawberries, raspberries

(c) Forage Crops - alfalfa, red clover, alsike clover, orchard grass, and brome grass.

(d) Cereal Grains - wheat, oats and barley.

Application to Agriculture

(a) Within Climatic Class 1, production of the full range of the above crops is possible in areas with Agriculture Capability Classes 1 to 3

(b) Within areas of Agriculture Capability Class 4, it is possible to have production of forage, cereal grains, and speciality crops depending on annual climatic variation and specific soil estimations.

(c) Areas with Agriculture Capability Class 5 in a Climatic Class 1 are only useful for the production of forage crops.

Climatic Class 2

Characteristics

The frost free period is 75 to 90 days.

The range of growing degree days greater than 42°F is 1900 to 2150.

Annual precipitation is less than 15 inches.

The May-September precipitation is less than 8 to 10 inches.

There is a climatic moisture deficit of 1.5 to 4.5 inches during the growing season in dryland areas.

Range of Crops

- (a) General- asparagus, beets, broccoli, brussel sprouts, cabbage, carrots, Kohlrabi, leeks, lettuce, parsnips, radishes, rhubarb, turnips, spinach, Swiss chard, strawberries and only very hardy varieties of broad beans, cauliflower, celery, peas, raspberries and potatoes. (Production of these latter crops is marginal.)
- (b) Forage Crops - alfalfa, red alsike, sweet clover, brome grass and timothy.
- (c) Cereal grains - wheat, oats and barley (Harvesting problems may occur because of poor weather)

Application to Agriculture

- (a) Within Climatic Class 2, production of the full range of the above crops is possible in areas with Agriculture Capability Class 2 or 3.
- (b) Within areas of Agriculture Capability Class 4, it is possible to have production of forage crops and cereal grains depending upon annual climatic variation.
- (c) Only forage crops can be produced in areas of Agriculture Capability Class 5.

Climatic Class 3

Characteristics

The frost free period is 60-75 days.

The range of growing degree days greater than 42°F is 1650 to 1900.

Annual precipitation is less than 13 inches.

The May-September precipitation is less than 8.5 inches.

A climatic moisture deficit of 4.5 to 7.5 inches occurs during the growing season in dryland areas.

Range of Crops

- (a) General - Cool loving vegetables and small fruits in favoured local sites, cabbage, cauliflower and potatoes.
- (b) Forage Crops - alfalfa, red alsike, brome grass, sweet clover, and timothy (more emphasis on clovers and timothy than in Climatic Class 2).
- (c) Cereal crops - oats, barley.

Application to Agriculture

- (a) Within Climatic Class 3, production of the full range of the above crops is possible in areas of Agriculture Capability Class 3.
- (b) Areas with Agriculture Capability Class 4, are useful for the production of forage crops with barley and oats capable of being grown periodically.
- (c) Only forage crops can be produced in areas of Agriculture Capability Class 5.

Climatic Class 4

Characteristics

The frost free period is 50 to 60 days.

The range of growing degree days greater than 42°F is 1650 to 1900.

A climatic moisture deficit of 7.5 to 10.5 inches occurs during the growing season in dryland areas.

Range of Crops

- (a) General - No potatoes, hardy varieties of cool-loving vegetables.
- (b) Cereal crops - Barley and oats are capable of being grown periodically.
- (c) Areas with Agricultural Capability Class 4 are capable of producing forage crops.

Climatic Class 5

Characteristics

The frost free period is 30 to 50 days.

The range of growing degree days greater than 42°F is 1200 to 1650.

A climatic moisture deficit of 10.5 to 13.5 inches occurs during the growing season in dryland areas.

Range of Crops

Only forage crops are produced and these occur in areas with Agriculture Capability Class 5.

Agriculture Capability Class 5M or 5X is given the capability rating of 5CM or 5CX in areas where climate is a limitation as well as drought (M) or a combination of limitations (X)* although a range of forage crops can still be grown.

Climatic Class 6

Characteristics

The frost free period is less than 30 days.

The range of growing degree days greater than 42°F is 800 to 1200 .

A climatic moisture deficit of 13.5 to 16.0 inches occurs during the growing season in dryland areas.

Range of Crops

The area is limited to native browse (grazing) species of plants.

It is not suitable for cultivating of agricultural crops but it has some potential.

* See: The Canada Land Inventory, "Soil Capability Classification for Agriculture", Report No. 2, Queen's Printer, Ottawa, 1965.

Climatic Class 7

Characteristics

The frost free period is highly variable but it is usually less than 30 days.

The number of growing degree days greater than 42°F is less than 800.

Range of Crops

There is no potential for agriculture, intensive or extensive because the area is largely rock and ice (climatically determined).

SUBCLASSES

With the exception of Class 1d the classes are sub-divided into sub-classes according to the nature of the limitation that determine the class.

The following sub-classes denote the nature of the climatic limitation that affects the capability of the land to support agriculture.

SUB-CLASS A: Drought or Aridity which occurs during the growing season which results in moisture deficits developing in the soil such that plant growth is severely limited. This is not to be confused with drought caused by soil limitations.

SUB-CLASS E: Extreme minimum temperatures occurring during the winter season which injure or kill dormant or near dormant trees.

SUB-CLASS F: Any minimum temperatures above or below freezing which damagingly affect plant growth, during the growing season. This is not to be confused with sub-class E (above).

SUB-CLASS G: Insufficient heat units (growing degree days) during the growing season. This does not include Corn Heat Units.*

SUB-CLASS H: Generally low temperatures during the growing season which severely lower heat unit accumulation.

* For a definition of Corn Heat Units see: The Canada Land Inventory, "The Climates of Canada for Agriculture", Report No. 3, Queen's Printer, Ottawa, 1966, pp. 9-10.

SUB-CLASS U: Limitations due to wind exposure.

SUB-CLASS X: Combination of low temperatures, low heat unit accumulations, high snowfall, excess winds.

SUB-CLASS Y: Excess precipitation during the growing season, causing flooding, poor tractability, generally poor harvest conditions.

EXPLANATION OF MAP SYMBOLS

In British Columbia, Climate Capability for Agriculture maps show a dual symbol. An unbracketed symbol indicates the capability rating under dryland (dry farming) whereas a bracketed symbol gives the capability under irrigated conditions. In some situations, both wet and dryland ratings will be indicated.

Example I 4A
(3GF) indicates an area has dryland rating of 4A. It may also be considered as a 3GF rating under irrigated conditions.

Example II $4A^7 - 4A^3$
(3GF) (4F) is an example of a complex where 70 percent of the area is rated as 4A dryland. This portion can also be considered as a 3GF rating under irrigated conditions. The remaining 30 percent of the area has a 4A dryland rating or an irrigated rating of 4F.

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